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PETROGRAPHY.[1]

Geology of Angel Island, San Francisco Bay.—Angel Island in San Francisco Bay, Cal., consists essentially of a syncline of sandstone interbedded with an intrusive sheet of fourchite and cut by a serpentine dyke and a second mass of fourchite. A radiolarian chert is associated with the sandstone. The most interesting feature connected with the rocks is the discovery by Ransome[2] that both the fourchite and the serpentine have effected metamorphic changes in the sandstone and in the chert, and that in all cases the resulting product is the same, viz., a glaucophane schist. The serpentine and the fourchite are thus true eruptive rocks, neither being, as supposed by Becker, a metamorphosed sediment. The glaucophane schists are true contact rocks, and are not the result of a general oregional metamorphism of pre-existing rocks. Not only do they occur as contact facies of the sandstones and cherts, but the former rock often contains pebbles of schists, in their essential features similar to the contact schists· The sandstone is made up of quartz, plagioclase and fragments of various rocks. The fourchite consists almost entirely of nearly colorless augite in rounded or irregular grains, and a small quantity of an interstitial substance composed of smaller granules of augite and a fine grained neatrix, which under high powers resolves itself into small, stout colorless crystals imbedded in a yellowish-green substance that is nearly isotropic. The crystals are thought to be zoisite, which may be an alteration product of plagioclase, although the author thinks this origin not probable. Often the augite is changed peripherally into glaucophane, which either replaces the pyroxenes, fills cracks in them, or occurs in the spaces between adjacent grains. A few of the specimens examined possess a glassy groundmass and others are porphyritic. Brecciated and spheroidal facies were also observed. The schist produced by the alteration of the sandstones and cherts is sometimes composed of aggregates of glaucophane in a matrix of colorless albite. Brown mica, garnets and sphene are also present to some extent in the rock. Other varieties of the schist are essentially aggregates of quartz and glaucophane. Occasionally the glaucophane is in falrly well defined crystals, but usually it is in sheaf-like bundles of fine needles. The altered cherts now consist of spherules of cryptocrystalline silica or grains of recrystallized quartz and microlites and bundles of nearly colorless augite. The serpentine on the island is nodular as the result of shearing. It was derived in all probability from a rock made up almost exclusively of diallage. It contains granules of chromite. This serpentine has effected the same alterations in the chert and sandstone through which it cuts, as has the fourchite. Some peculiar inclusions of a dark rock in the serpentine are supposed to be the remnants of a dyke that formerly occupied the fissure, which the serpentine subsequently filled. These fragments now consist of a holocrystalline aggregate of augite and albite, of which the first mineral is sometimes altered to green and brown hornblende. Analyses of the fourchite (I) and of a fresh nodule of serpentine (II) follow:

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Bull. Dept. Geol. Univ. of Cal., Vol. 1, p. 193.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	K_2O	Na_2O	P_2O_5	Loss	Total
I.	46.98	17.07	1.85	7.02	12.15	8.29	.53	2.54	.09	4.86	=101.38
II.	42.06	2.72		2.88		39.53	not estimated			12.04	= 99.23

A New Rock-Volcanite.—In an abstract of a paper to appear in a German periodical, Hobbs[3] gives an account of an anorthoclase-augite rock which he calls volcanite. It occurs as bombs projected from Volcano in 1888–89. Phenocrysts of anorthoclase, andesine, an acmitic augite and olivine are imbedded in a groundmass containing two generations of the first named of these minerals in a glassy base. The augite phenocrysts in many instances have been resorbed by the rock's magma and have thus given rise to pseudomorphs of colorless pyroxene, magnetite, and plagioclase. The structure of the rock is trachytic. Its chemical composition corresponds with that of the dacites, while its mineralogical composition is that of an augite pantellerite. Analyses of the anorthoclase (II) and of the rock mass (I) follow:

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	Na_2O	K_2O	H_2O	P_2O_5	Total
I.	66.99	17.56	1.41	3.39	tr	4.25	.93	3.35	.34	1.53	tr	= 99.75
II.	60.01	20.12	2.82			5.15	.23	6.43	3.67	.77		= 99.20

Acmite Trachytes from Montana.—Among the eruptive rocks occurring as dykes, sheets and laccolitic masses in the Cretaceous of the Crazy Mts. are acmite trachytes and eleolite syenites. The former, according to Wolff,[4] is present in small sheets and dykes and in apophyses from laccolitic masses. It is a rock made up of phenocrysts of anorthoclase, sodalite and augite in a groundmass of lath-shaped feldspars and acicular aegirines and acmites imbedded in a colorless interstitial matter, composed in all probability of nepheline and analcite. The augite phenocrysts are provided with an outer zone of aegerine. Needles of this mineral are included in all the colorless constituents. The eleolite syenite is from the laccolites. It is panidiomorphic, with fresh onorthoclase phenocrysts in a fine grained mass of feldspar, augite, aegerine, acmite, the angular spaces between which are occupied by nepheline. Analyses of the syenite and of one variety of the trachyte gave:

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[3] Bull. Geol. Soc. Amer., Vol. 5, p. 598.

[4] Bull. Mus. Comp. Zool., xvi, p. 227.

SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	Na_2O	K_2O	TiO_2	P_2O_5	Ign.	Loss	Total
59.66	16.97	3.18	1.15	.19	2.32	.80	8.38	4.17	tr	.14	2.53	.07	99.56
62.17	18.58	2.15	1.05	tr	1.57	.73	7.56	3.88	tr	.11	1.63	.07	99.50

Petrographical Notes.—In a glassy rock from near Harrismith, in the Orange Free States, Molengraff[5] finds small crystals of twinned cordierite, little octahedra of magnetite and skeleton crystals of augite. The cordierite is slightly pleochroic. Its crystals are well defined and possess all the peculiarities of the mineral. An analysis of the rock shows:

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	K_2O	Na_2O	Loss	Total
64.54	.79	19.16	7.23		3.39	2.47	.57	1.13	2.25	=101.53

The large percentage of SiO_2 present as compared with the small percentages of the alkalies suggests to the author that the rock is an abnormal type. After a critical discussion of the literature of cordierite as a rock component, the conclusion is reached that, in all probability, the specimens studied represent foreign inclusions fused in a basic rock.

A very brief account of the lavas and ashes of the old volcano Rhobell Fawr near Dolgelley in Wales, is given us by Cole.[6] The greater portion of the products are ashes containing hornblende and augite. The lavas are augite, aphanites and basaltic and andesitic andesites.

[5] Neues Jarb. f. Min. etc., 1894, I, p. 79.

[6] Geol. Magazine, x, 1893, p. 337.

Rutley[7] gives a few illustrations in proof of his statement that the production of spherulites is sometimes a devitrification process subsequent in point of time to the development of perlitic cracks in the volcanic rocks in which they occur.

In a recent number of Science Blake[8] suggests the notion that many of the quartz veins, 'reefs' and boss-like masses in ancient rocks are the result of deposition from old thermal springs.

The rock of Saint Sardoux, Puy-de-Dame, France, is composed[9] of ilmenite and soda-augite in a groundmass consisting largely of nepheline crystals cemented by a matrix of feldspar and glass. Sometimes the augite and nepheline are intergrown like the constituents of a pegmatite and at other times they form an ophitic aggregate, with the nepheline the older component. The rock penetrates the peperites of the region in the form of dykes and veins.

New Books.—Granites and Greenstones[10] is the title of a new series of tables for the determination of rocks and their essential components. The author, Mr. Rutley, divides rocks into Volcanic rocks, Dykes and Sills and Plutonic masses, and then subdivides each group into four series as follows: Ultra-basic with $SiO_2=39–45$ per cent; basic, with silica 45–55 per cent, intermediate, with $SiO_2=55–66$ per cent; and acid, with silica over 66 per cent. The ultra-basic series is divided into the non-feldspathic and the potentially feldspathic, including nepheline and leucite non-feldspathic rocks. The basic rocks are all plagioclastic. They include a nephelinic or leucitic and a non-nephelinic group. In the dyke and sill division of this series are included the diabases. In the intermediate series we find again two groups—the orthoclastic and the plagioclastic, and in each of these nepheline and non-nepheline sub-groups. The acid series includes a division whose feldspars are plagioclase or anorthoclase, and one in which the feldspar is orthoclase. Definitions and notes are abundant and are so given as to really explain the tables. The elvans are described as the apophyses of deep seated granitic masses. They include micro-granites, aplites, quartz-porphyries and greisens. The mineralogy tables contain no startling novelties. They are good and the book itself is well worth study. It will serve as a useful companion to the student.

[7] Quart. Jour. Geol. Soc., Feb. 1894, p. 10.

[8] Science, Vol. xxiii, 1894, p. 141.

[9] Bull. Soc. Franc. d. Min. xvii, p. 43.

[10] Granites and Greenstones, a series of Tables and Notes for Students of Petrology. By Frank Rutley. London, Thos. Murby, 1894, pp. 48.

In an article of 52 pages on the optical recognition and economic importance of the common minerals found in building stones, Luquer[11] mentions the principal microscopic characteristics of the most important minerals with sufficient fullness to enable the technical student to determine them in the thin section. He also notes the effect of presence of each upon the value of the various building stones in which they occur. He, moreover, describes the usual associates of each different mineral, and so incidentally gives the composition of the principal rocks used in constructions. The article in pamphlet form is simple and useful.

[11] School of Mines Quart. xv, p. 285–336.